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Impact of Cloud Computing Announcements on Firm Valuation

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ABSTRACT

With increasing demand for Cloud Computing services, a growing number of firms are citing business agility and cost savings as motivators for adopting Cloud Computing services. Extant literature does not provide any empirical evidence of value of announcements made regarding the Cloud Computing environment. This paper examines impact of Cloud Computing announcements on firm valuation, using event study methodology. This study explores the market impact of adoption of Cloud Computing on the cloud vendors/providers and customers/adopters. The impact on firm value of the competitors, of the companies adopting Cloud Computing services, is also analyzed. The study shows that there is a significant impact of those announcements on the firm value of the companies. However, it shows a contrasting impact on the customers, vendors and their respective competitors, when analyzed separately.

Keywords

Cloud Computing, Event Study, Market Valuation, Technology adoption, business value, firm performance

1. INTRODUCTION

The firms that decide to adopt Cloud Computing quote the potential reduction in costs as the primary reason for their decision. More than half of the cloud adopters cite business agility as the reason for their decision (Fogarty, 2010; Pemmaraju, 2010). However, the strategic decision to adopt Cloud Computing services should weigh in potential benefits as well as the risks (Chakraborty, 2010). To find out how announcements related to Cloud Computing affect the stock price of stakeholders, we carry out an event-study based research. Our study provides empirical findings, based on analysis of 383

announcements of cloud adoptions from 2008 to 2010, to evaluate the impact of Cloud Computing announcements on firm valuation.

2. RESEARCH BACKGROUND AND MODEL

The National Institute of Standards and Technology (NIST) defines Cloud Computing as “a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction”(Mell, 2011). When one or more of these configurable computing resources are availed via a service provider, we define it as adoption of Cloud Computing.

The commoditization of IT services in the name of Cloud Computing has not only increased the expectation of the outsourcers, but also enabled provision of services in a specialized and pervasive manner for the IT service providers. This has allowed companies to not worry about how the services are implemented, but rather focus on their core business processes. (Pring, 2010).

Apart from business agility which is an advantage of the commoditization of services, the increasing market for Cloud Computing, potential cost savings on Infrastructure investments, reduction in maintenance cost including the human resource required for maintenance and potential reduction in future investment costs are some of the major reasons for adoption of Cloud Computing (Swoyer, 2010). The market presence Cloud Computing is expected to improve in the years to come (Hickey, 2010).

2.1 Research Model

Firms adopt Cloud Computing in the expectation of positive returns. However, there has been very little research to determine the value gained by the firms adopting Cloud Computing services. It has been difficult to measure the effects of Cloud Computing adoption on the announcing company. Internal accounting measures such as return on investments and internal rate of return have been used for measuring financial benefits of IT investments. But these measures are difficult to apply to Cloud Computing announcements as there is little information available about changes to cash flows due to the announcement (Dehning and Richardson, 2002). Considering the various factors that influence the adoption of Cloud Computing services we employ an external measure of impact of the event of adoption of Cloud Computing services.

The effect of the announcement of a cloud service adoption may vary from firm to firm and the expected benefits may not be reflected within a limited time frame. The stock price would show the impact of such an announcement more appropriately since it takes all future benefits and costs into account, independent of the likelihood of its occurrence. (Agrawal et al., 2006) The market performance would thus be a consistent and reliable indicator of the impact of such announcements which can be examined using Event Study. In the past, Event Studies have shown strategic and innovative investments on IT having positive impact on the stock prices of a firm (DosSantos, et al., 1993). We therefore examine whether Cloud Computing announcements also affect the stock prices, of various firms through five hypotheses (also shown in Figure 1).

Extant work on benefits of Cloud Computing has shown cost savings, scalability and improved availability (Palankar et al., 2008), increased performance (Menon et al, 2005; Ranadive, 2008), resource utilization (Foster, 2006) and environmental sustainability, amongst others. Cloud Computing provides a variety of opportunities for companies adopting and for companies offering Cloud Computing products and services. H1 refers to all the Cloud Computing announcements (383), including announcements about adoption (52). The inner boxes, in Figure 1, showing vendors and adopters are only 52 of a total of 383 announcements. Recent movement towards adoption of these services is a testament of growing importance of Cloud Computing. In light of the positive investors' perception that will create for the companies involved, we expect Cloud Computing announcements to create positive market reaction. In words of Etro (2009) “Its impact will be spectacular on both consumers and firms (pp: 182).”Hence, we hypothesize:

H1: *Cloud Computing announcements will positively impact market valuation of all the involved companies.*

After finding the impact of Cloud Computing announcements on stock prices, we, separately, examine the effect on such announcements on the Cloud Customers/adopters and on Cloud Vendors to identify which category derives more value out of

these announcements. Cloud Computing allows companies to reduce various operating fixed costs while facilitating adoption of newer business initiatives and business creation. So, we hypothesize that:

H2: *Cloud Computing announcements will positively impact market valuation of Cloud adopters.*

Cloud Computing has enabled companies to lease computing infrastructure including software and hardware, that has saved them a lot of money (Carr, 2003). Over time, the model has shown to 1) provide stable and scalable computing capabilities (Rappa, 2004) and 2) leverage Internet for creating agile and flexible business environment (O'Reilly, 2005). From vendors' perspective, this has created enormous business opportunity to provide the cloud services over Internet (Zittrain, 2007). IDC (2008) predicts that corporate investments in cloud-based computing to increase from \$16.2 billion in 2008 to \$42 billion in 2012 (an increase from 4% share to 9% of IT services spending), signifying a large part of growth in IT spending.

H3: *Cloud Computing announcements will positively impact market valuation of Cloud Vendors.*

Abnormal changes in stock price are due to change in investors' perception about company's profitability and efficiency. Such adverse announcements have potential to affect the stock prices of other companies in the industry. Usually change in profitability can be accounted to customers shifting to competitors for same products or services. Research has shown that there are some events that can cause competitor's stock price to change. Recent researches have shown that occurrence of an event has had a similar impact on the competitors as on the company that is related to the event. For example, Lang and Stulz (1992) show that stock price of the bankrupt firm's competitor's decreases by 1% at the time of the bankruptcy announcement and that the decline is statistically significant. Eckel et al. (1997) also showed statistically and economically significant impact on competitors' market value due to airline privatization announcement. Thus, we expect negative impact on stock price of competitors of cloud adopters and vendors. So, we hypothesize as follows:

H4: *Cloud Computing announcements will negatively impact market valuation of competitors of Cloud adopters.*

H5: *Cloud Computing announcements will negatively impact market valuation of competitors of Cloud vendors.*

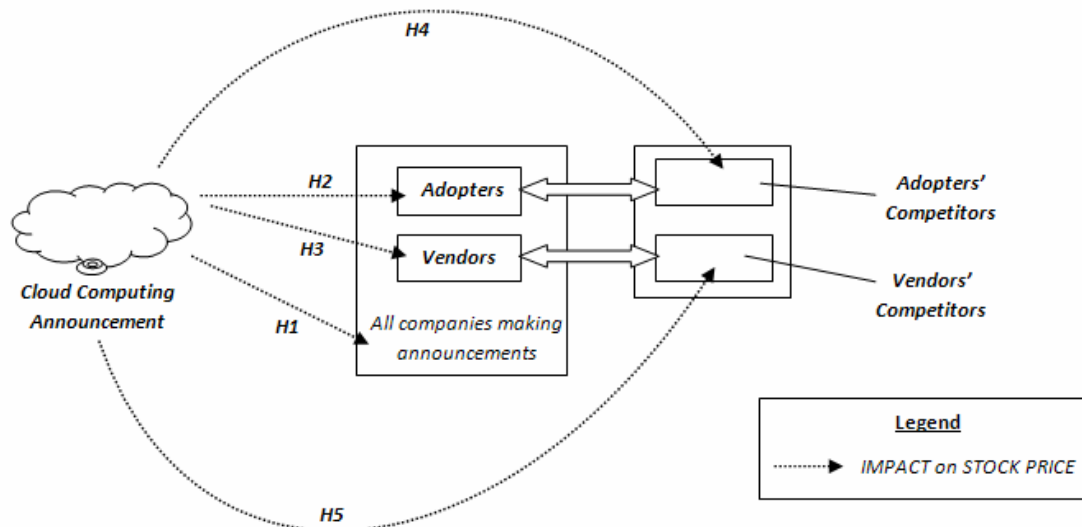


Figure 1: Research Model

3. RESEARCH METHODOLOGY

3.1 Data Collection

In this research, we collected 383 Cloud Computing announcements. 52 of these announcements pertain to Cloud Computing adoption. We obtained historical stock price information for companies making the announcements from the Centre for Research in Security Prices (CRSP) at the University of Chicago. CRSP contains price information of stocks listed in the New York Stock Exchange (NYSE), American Stock Exchange (AMEX), and NASDAQ (Andrade, et al., 2001). The announcements were collected from press releases of the companies and popular news websites that release Cloud Computing news. Out of the 52 cloud adoption announcements, there are 47 vendors and 34 Adopters that are publicly traded in the US market. We also collected stock price information of 3 publicly traded competitors of each of the cloud adopters and cloud vendors. Competitor companies were identified from the “Hoovers” database as the source. In this analysis, the date of announcement has been used as the date to perform competitor analysis.

3.2 Event Study Methodology

Event Study’s popularity and relevance to IS research has gained tremendous attention and traction and such studies are becoming common in IS literature (Peak et al, 2002; Aggrawal et al, 2006; Hayes et al, 2001; Ranganathan and Brown, 2006; Chai et al., 2010; Dos Santos et al., 1993; Im et al, 2001; Koh and Venkatraman, 1991; Roztock and Weistroffer, 2006; Subramani and Walden, 1999; Agrawal et al, 2006; Cavusoglu et al., 2004; Kannan et al., 2004; Campbell et al., 2003), Gupta and Sharman, 2010; Song et al, 2007) amongst others. In our research, the Event Study methodology has been used to measure the firm performance. We used market performance measures like stock prices in our study instead of accounting performance measures because the market measures take into account, publicly available information to predict the cash flows and profits to establish the value of a firm. On the other hand accounting performance measures are used only when the benefits of an event and the exact time period in which the benefits can be obtained are defined accurately (Agrawal et al, 2006; Dehning and Richardson, 2002; Beasley, Bradford and Dehning, 2009). Our paper studies whether the market adjustment made to the value of firms due to Cloud Computing announcements are witnessed immediately in the form of changes in the stock market prices of the firms (Agrawal et al., 2006). Immediate changes would tell us that the market does react to the Cloud Computing announcements (Agrawal et al., 2006). We also assess how an announcement of cloud adoption changes the stock prices of adopters of the cloud, the vendors, the competitors of the adopters and the vendors.

3.3 Abnormal Returns

In our research Abnormal stock returns serve as the metric of the economic impact of Cloud Computing announcements and cloud adoption announcements (Agrawal et al., 2006). In an event study, abnormal returns are calculated for an event window. The most important choice in an event study is the choice of the length of the event window (Agrawal et al., 2006, McWilliams et al., 1997). Based on prior event studies in the field of information systems, we chose event windows of (-1,1) (-1,2) (-1,3) (-1,4) and (0,1) (0,2) (0,3) (0,4) in addition to taking the actual date of announcement or the zeroth day.

We used the market adjusted returns model, for the computation of abnormal returns. To compute the abnormal returns we used the Eventus software package. Given an event window and the model for abnormal returns calculation, the eventus software computes the abnormal returns for firms for that window, by interfacing SAS and the CRSP database (Agrawal et al., 2006).

Based on the Market adjusted model, the abnormal returns for a firm i on day t is,

$$A_{it} = R_{it} - R_{mt} \quad (1)$$

Where

R_{it} is the return of stock for firm i on day t

R_{mt} is the CRSP value weighted market return on the same day

Since we are looking at N firms, we need to aggregate the abnormal returns for each day for the period t , therefore we formulate Mean Abnormal Return (MAR_t),

$$MAR_t = \sum_{i=1}^N AR_{it} \quad (2)$$

Cumulative Abnormal Return (CAR) is used to measure the change in firm value. The CAR for the Cloud Computing announcements for the firm i for the period $t1$ to $t2$ is given by

$$CAR_i(t1, t2) = \sum_{t=t1}^{t=t2} A_{it} \quad (3)$$

In our research, since we are looking at the CAR for many firms, we need to compute the Mean Cumulative Abnormal Return (ACAR). For an event window T , the ACAR for N firms is given by,

$$mCAR_i(t1, t2) = 1/n \sum_{i=1}^n A_{it} \quad (4)$$

Then we use Patell Z test statistic (a standardized parametric test) to check if the MCAR are significantly (statistically) different from zero. If the significance is found in this test, we can say that the Cloud Computing announcements made an impact on the stock market. The magnitude of the impact can also be inferred based on the level of significance. (Agrawal et al., 2006; Beasley et al, 2009; Goel and Shawky, 2009; McWilliams et al., 1997).

4. Results

We investigated seven event windows for evaluating impact of Cloud Computing announcements on different stakeholder companies such as adopters, vendors and competitors. We discuss the results we obtained of these groups of companies next. We had nine event windows for each hypothesis and in this section, we only present the ones that show any significance. For each hypothesis, we have omitted event windows that report inconclusive results.

Window	ACAR	Positive:Negative	Patell Z	Generalized Sign Z
(-1,+4)	0.39%	232:208>	2.460**	2.046*
(-1,+3)	0.35%	241:199>>	2.192*	2.905**
(-1,+2)	0.33%	239:201>>	2.000*	2.714**
(-1,0)	0.34%	227:213)	2.209*	1.569\$
(0,+2)	0.40%	241:199>>	2.446**	2.905**
(0,+3)	0.41%	237:203>>	2.568**	2.523**
(0,+4)	0.46%	236:204>>	2.800**	2.427**

Table 1: Window based results of all Cloud Computing announcements

Table 1 shows market adjusted returns for the 383 Cloud Computing announcements collected during the period from 2006 to 2010. The symbols \$, *, **, *** denote statistical significance at the 0.10, 0.05, 0.01 and 0.001 levels, respectively. As Table 1 shows, the market reacts positively and significantly to Cloud Computing announcements. The market thus shows attention to Cloud Computing announcements. There is 1% level of significance for the average cumulative abnormal returns for the windows (-1, +3), (-1, +2), (0, +2) (0, +3) and (0, +2) while the window (-1, +4) shows 5% level of significance. Clearly, there is a statistically significant delayed response to Cloud Computing announcements. Figure 1 shows daily mean abnormal return, where we see a spike on day 0 representing 0.34% positive return at 0.4%, good at 0.01 level.

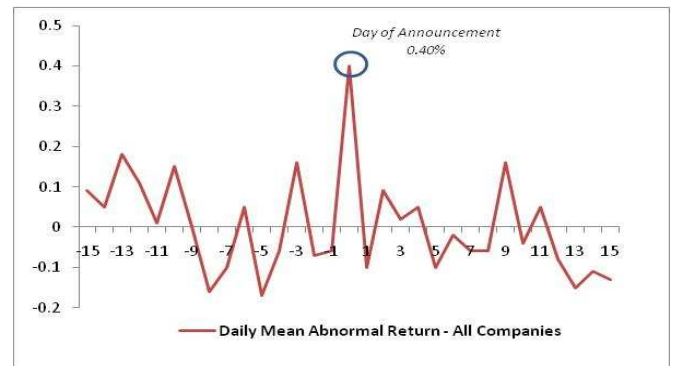


Figure 1: Daily Mean Abnormal Return: All Companies

Window	ACAR	Positive: Negative	Patell Z	Generalized Sign Z
(-1,+4)	1.11%	21:13>	1.490\$	1.656*
(-1,0)	-0.04%	18:16	0.105	0.626
(0, +2)	0.64%	22:12>	1.312\$	2.000*
(0,+4)	1.17%	22:12>	1.719*	2.000*

Table 2: Market Adjusted Returns for the cloud adopters

Table 2 shows the market adjusted returns for the 34 adopters of Cloud Computing associated with the announcements of cloud adoptions for the period 2006 to 2010. There is positive average cumulative abnormal return of 1.11%, 0.64% and 1.17% for the adopters at 5% level of significance for the windows (-1, +4), (0, +2), (0, +4), respectively. This indicates that cloud adopters benefit from the announcements related to Cloud Computing.

Window	ACAR	Positive: Negative	Patell Z	Generalized Sign Z
(-1,+2)	0.07%	29:18>	0.182	1.965*
(-1,0)	-0.02%	26:21	0.380	1.088
(0, +2)	0.89%	29:18>	1.207	1.965*
(0, +3)	1.24%	31:16>>	1.387\$	2.549**
(0,+4)	1.32%	29:18>	1.061	1.965*

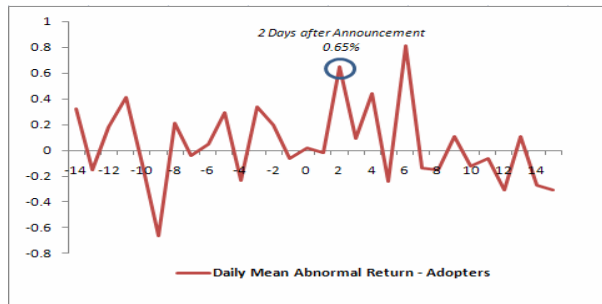
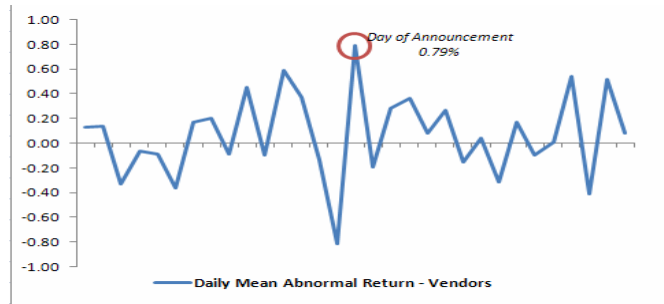
Table 3: Market Adjusted Returns for the cloud vendors**Figure 2: Daily Mean Abnormal Return: Adopters****Figure 3: Daily Mean Abnormal Return: Vendors**

Table3 shows the Average Cumulative abnormal returns for the 47 cloud vendors involved in the announcements from 2006 to 2010. The result is positive for windows (-1, +2) (0, +2) (0, +4) at 5% level of significance with ACAR as 0.07%, 0.89%, 1.32% respectively for the generalized test. There was positive ACAR of 1.24% for the window (0, +3) with 1% level of significance. This shows that there was a positive impact of a cloud adoption announcement on the respective adopters. This supports the assumption that the vendors are benefited by making cloud related announcements, there does seem to be a delay in reaction to the announcements in the market. Figures 2 and 3 show daily mean abnormal return, where we see a spike on 2 days after announcement and on day 0 for adopters and vendors respectively.

Window	ACAR	Positive: Negative	Patell Z	Generalized Sign Z
(-1,+3)	0.65%	51:37>	1.587\$	1.940*
(-1,0)	0.02%	42:46	0.311	0.019
(0, +2)	0.52%	51:37>	1.769*	1.940*
(0, +3)	0.83%	55:33>>	2.174*	2.794**
(0,+4)	0.74%	51:37>	1.893*	1.940*

Table 4: Market Adjusted Returns for the competitors of Cloud Computing adopters

Table 4 shows the Market Adjusted Returns for the 88 competitors of Cloud Computing adopters who adopted the cloud, during the period from 2006 to 2010. There is a positive abnormal return for the competitors of the adopters associated with the announcements. As the results show, there is positive return with ACAR as 0.65%, 0.52% and 0.74% for the windows (-1, +3), (0, +2) and (0, +4) respectively. This shows that the firm value of the competitors also increase along with that of the adopters. The delay in reaction to the announcements is consistent with the one we observed with the adopters.

Window	ACAR	Positive: Negative	Patell Z	Generalized Sign Z
(-1,+3)	-0.17%	77:66)	-0.283	1.491\$
(-1,0)	0.01%	72:71	0.518	0.654
(0, +3)	-0.05%	76:67)	-0.218	1.324\$
(0,+4)	-0.24%	68:75	-0.596	-0.016

Table 5: Market Adjusted Returns for the competitors of Cloud Computing vendors

Table 5 shows the Market Adjusted Returns for the 143 competitors of Cloud Computing vendors who were adopted during the period from 2006 to 2010. The competitors of the Cloud Computing vendors do not show significant positive returns. The abnormal returns are negative with marginal significance. The windows (-1, +3) and (0, +3) show negative abnormal returns with 10% level of significance. This shows that the announcements related to Cloud Computing does not benefit the competitors of the vendors.

Hypothesis	Result	Sample Size	Mean Abnormal Return	Positive : Negative	Patell Z	Generalized Sign Z
H1	Supported	440	0.40%	237:203>>	3.360***	2.523**
H2	<i>Not Supported</i>	34	0.02%	20:14)	0.343	1.313\$
H3	Supported	47	0.79%	31:16>>	2.265*	2.549**
H4	<i>Not Supported</i>	88	0.21%	46:42	1.238	0.873
H5	Supported	143	0.12%	78:65>	0.931	1.659*

Table 6: MAR on the day of the announcement all the hypotheses under consideration

Table 6 shows the market adjusted mean abnormal returns on the day of announcement for all the companies under the five stated hypotheses. The hypotheses H1, H3 and H5 are supported by the results. The hypothesis H1 is supported with 0.1% level of significance for the Patel Z test and with 1% level of significance for generalized test. Similarly, H3 shows positive returns with 1% level of significance and H5 is supported with 5% level of significance for the generalized Z test. One interesting result for all the three supported hypotheses is that they show a delayed reaction to announcements, of 3 or 4 days from the day of announcement. The hypotheses surrounding adopters and their competitors are not supported.

5. Implications and Conclusion

News media coverage has never been more important either in print or electronic form for reputation management (Carroll, 2004; Carroll and McCombs, 2003; Meijer, 2004). Companies tend to disclose information that is likely to be positively interpreted by the investors with the objective of improving the firm's valuation (Verrecchia, 1983; Dye, 1985). Organizations and its stakeholders should attempt to establish "mutual expectations" through their communication (Turek, 1982, p. 166). Given the current state of technology and rate of Cloud Computing adoption, most of the positive effects of Cloud Computing is going to be determined by the speed and extent of adoption. Besides potential benefits of Cloud Computing, the policymakers and managers can benefit from our study that sheds light on the effects of making such announcements on shareholder's wealth. Our results indicate that when all the announcements are analyzed together, there is significant positive impact on stock price, albeit a few days delayed from the day of announcement. Vendors and competitors of vendors have also shown positive impact on certain windows. For adopters, we do observe delayed positive impact, though results are not significant. This can be partially due to the small sample size which failed to show any significance. Overall, for policy makers the study does present findings that are valuable in terms of impact of announcements on the stock price. The study excluded announcements made in year 2011 due to unavailability of CRISP data. Our future direction on the research includes incorporating the additional data from 2011 and re-testing the hypotheses. Also, we will segment the companies based on their sector, size, etc to investigate any moderating effects of firm characteristics on the impact on stock

price. In addition, we plan to add a control group (comprised of announcements that are not related to Cloud Computing initiatives) and compare the results with the current of announcement.

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